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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/759,444	01/14/2004	Chi tse Wu	H0002800.34350 USA -4015	7831
128 7590 04/22/2011 HONEYWELL INTERNATIONAL INC. PATENT SERVICES 101 COLUMBIA ROAD P O BOX 2245 MORRISTOWN, NJ 07962-2245			EXAMINER MCDONALD, RODNEY GLENN	
			ART UNIT 1724	PAPER NUMBER
			MAIL DATE 04/22/2011	DELIVERY MODE PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/759,444	WU ET AL.	
	Examiner	Art Unit	
	Rodney G. McDonald	1724	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on May 12, 2010 and April 20, 2011.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 67-76 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 67-76 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date. _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on May 12, 2010 has been entered.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 67, 69, 73-76 are rejected under 35 U.S.C. 102(e) as being anticipated by Michaluk (U.S. PG PUB. 2002/0157736).

Regarding claim 67, Michaluk teaches a three dimensional physical vapor deposition target. (i.e. a hollow cathode magnetron). The target can be made of Ta. The average grain size can be about 150 microns or less within the material. Michaluk suggests a cup shape which is believed to read upon Applicant's cup shape limitation. A sputtering surface is present in the interior surface of the cup because hollow cathode

magnetrons operates as such. A cup is three dimensional and monolithic. A cast ingot is suggested. (Abstract; Paragraphs 0017, 0018, 0022, 0032)

Regarding claim 69, Michaluk teach the material consists essentially of tantalum; and wherein the target consists of the material. (Abstract; Paragraphs 0017, 0018, 0022, 0032)

Regarding claims 73-76, Michaluk teach these grain sizes. (Paragraph 0018)

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 67, 69, 73-76 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lu et al. (U.S. Pat. 6,471,831) in view of Michaluk (US PG PUB. 2002/0157736 A1).

Regarding claims 67, 69, Lu et al. teach a three dimensional physical vapor deposition target. The target can comprise a material for metallization such as Ta or Ti or any other material. The target has a shape, the shape includes at least one cup having a first end and a second end in opposing relation to the first end. The first end having an opening extending therein. The cup having a hollow therein. The hollow extending from the opening in the first end toward the second end. The cup having an interior surface defining a periphery of the hollow. A sputtering surface defined along the interior surface of the cup. The target is monolithic. The target has an exterior surface extending around the second end at rounded corners. (Figs. 1, 3-5; Column 2 lines 41-53)

As to the target comprising a cast ingot the process is given no weight since the product is substantially identical to the claimed subject matter. It should be noted that [E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process.” In re Thorpe, 777F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985) (citations omitted) Furthermore cast ingots will be discussed below.

The differences between Lu et al. and the present claims is that the average grain size of less than or equal to 250 microns is not discussed (claim 67), cast ingots is

not discussed (Claim 67) and the grain size of the target is not discussed (Claims 73-76).

Regarding claim 67, Michaluk teach the average grain size for hollow cathode sputtering targets to be less than or equal to 250 microns. (Abstract; Paragraphs 0017, 0018, 0022, 0032)

Regarding claim 67, Michaluk teach cast ingots for Ta targets. (Abstract; Paragraph 0017, 0018, 0022, 0032)

Regarding claim 73-76, Michaluk teach the claimed grain sizes. (Paragraph 0018)

The motivation for utilizing the features of Michaluk is that it allows producing a sputtering target with more homogenous microstructure. (Paragraph 0023)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Lu et al. by utilizing the features of Michaluk because it allows for producing a sputtering target with more homogenous microstructure.

Claims 67, 70 and 72-76 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lu et al. (U.S. Pat. 6,471,831) in view of Kardokus et al. (U.S. Pat. 6,113,761) and Michaluk (U.S. PG PUB. 2002/0157736 A1).

Regarding claim 67, Lu et al. teach a three dimensional physical vapor deposition target. The target can comprise a material for metallization such as Ta or Ti or **any other material (i.e. Cu)**. The target has a shape, the shape includes at least one cup having a first end and a second end in opposing relation to the first end. The first end

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having an opening extending therein. The cup having a hollow therein. The hollow extending from the opening in the first end toward the second end. The cup having an interior surface defining a periphery of the hollow. A sputtering surface defined along the interior surface of the cup. The target is monolithic. The target has an exterior surface extending around the second end at rounded corners. (Figs. 1, 3-5; Column 2 lines 41-53)

As to the target comprising a cast ingot the process is given no weight since the product is substantially identical to the claimed subject matter. It should be noted that [E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process.” In re Thorpe, 777F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985) (citations omitted) Furthermore cast ingots will be discussed below.

The differences between Lu et al. and the present claims is that the average grain size of less than or equal to 250 microns is not discussed with respect to three dimensional Cu targets (claim 67), casting is not discussed (Claim 67), the target being CuSn with Sn being present from about 100 ppm to about 3 atomic percent (Claim 70), the target being CuAg with Ag being present from about 100 ppm to about 3 atomic percent (Claim 72) and the grain size of the target is not discussed (Claims 73-76).

Regarding claim 67, 73-76, Kardokus et al. teach the grain size of a Cu target to be not more than 50 microns in planar targets. (Column 8 lines 57-59) Addressing the issue that Kardokus is limited only to planar targets one of ordinary skill in the art would be able to form the planar targets into three dimensional cup shaped target because Michaluk recognize that planar billets can be used as sputtering targets but that the billets can be shaped to form end products such as hollow cathode magnetrons and cup shapes with a fine, more homogeneous microstructure using his processing steps. (See Michaluk Abstract; Paragraphs 0017, 0018, 0022, 0032)

Regarding casting (Claim 67), Michaluk teach cast ingots for targets. (Abstract; Paragraph 0017, 0018, 0022, 0032)

Regarding claim 70, Kardokus et al. teach Sn present with CuSn. Alloying levels typically can be at least about 100 ppm. (Column 5 lines 8-16; Column 5 lines 20-24)

Regarding claim 72, Kardokus et al. teach Ag present with CuAg. Alloying levels typically can be at least about 100 ppm. (Column 5 lines 8-16; Column 5 lines 20-24)

The motivation for utilizing the features of Kardokus et al. is that it allows for forming interconnects on wafers. (Kardokus et al. Column 2 lines 43-45)

The motivation for utilizing the features of Michaluk is that it allows producing a sputtering target with more homogenous microstructure. (Michaluk Paragraph 0023)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Lu et al. by utilizing the features of Kardokus et al. and Michaluk because it allows for forming interconnects on wafers and for producing a sputtering target with more homogenous microstructure.

Claim 68 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lu et al. in view of Kardokus et al. and Michaluk as applied to claims 67, 70 and 72-76 above, and further in view of Kulkarni et al. (U.S. Pat. 6,283,357).

The difference not yet discussed is the target material consisting essentially of copper and wherein the target consists essentially of the same material. (Claim 68).

Regarding claim 68, Kulkarni et al. suggest various materials for sputtering targets. Among those materials is suggested copper. (Column 3 lines 35-51)

The motivation for utilizing a copper target is that it allows forming copper interconnects for metallization. (Column 3 lines 35-51)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have utilized the features of Kulkarni because it allows for forming copper interconnects for metallization.

Claim 71 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lu et al. in view of Kardokus et al. and Michaluk as applied to claims 67, 70 and 72-76 above, and further in view of Pavate et al. (U.S. Pat. 6,391,163).

The difference not yet discussed is utilizing aluminum in the copper target. (Claim 71)

Regarding claim 71, Pavate et al. teach utilizing aluminum ion a copper target. (Column 3 lines 20-29)

The motivation for utilizing the features of Pavate et al. is that it allows for increasing the hardness of the target. (Column 3 lines 20-29)

Therefore, it would have been obvious to one of ordinary skill in the art at the invention was made to have utilized the features of Pavate et al. because it allows for increasing the hardness of the target.

Response to Arguments

Applicant's arguments filed May 12, 2010 and April 20, 2011 have been fully considered but they are not persuasive.

In response to the argument that it would not have been obvious to one of ordinary skill in the art to have applied the teachings of two dimensional targets with small grain size to three dimensional targets having small grain size, it is argued that Michaluk teach that two dimensional billets having small grain size can be formed into final products having small grain size and that the end products can be formed into hollow cathode magnetron sputtering targets and cup shaped products. (See Michaluk discussed above)

In response to the argument that two dimensional targets of Kardokus are not analogous to three dimensional targets, it is argued that as suggested by Michaluk two dimensional billets having small grain size can be formed into final products having small grain size and that the end products can be formed into hollow cathode magnetron sputtering targets and cup shaped products. (See Michaluk discussed above)

In response to the argument that there is no discussion of using a cast ingot, it is argued that Michaluk teach that the tantalum billets can be a cast ingot. (See Michaluk discussed above)

Consideration of Declaration filed April 20, 2011:

In response to the argument that two dimensional targets of Kardokus are not analogous to three dimensional targets, it is argued that as suggested by Michaluk two dimensional billets having small grain size can be formed into final products having small grain size and that the end products can be formed into hollow cathode magnetron sputtering targets and cup shaped products. (See Michaluk discussed above)

In response to the argument that there was no appreciation or understanding in the art how to manufacture three dimensional targets having small grain size, it is argued that Michaluk's two dimensional billets having small grain size can be formed into final products having small grain size and that the end products can be formed into hollow cathode magnetron sputtering targets and cup shaped products. (See Michaluk discussed above)

In response to the argument that it would not have been obvious to one of ordinary skill in the art to have applied the teachings of two dimensional targets with small grain size to three dimensional targets having small grain size, it is argued that Michaluk teach that two dimensional billets having small grain size can be formed into final products having small grain size and that the end products can be formed into hollow cathode magnetron sputtering targets and cup shaped products. (See Michaluk discussed above)

The Examiner has cited a new reference to Michaluk which appears to show that two dimensional billets with small grain size can be formed into end products including

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hollow cathode magnetron sputtering targets and cups having small grain size with uniform microstructure. The Declaration address the Kardokus reference but does not address the Michaluk reference.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rodney G. McDonald whose telephone number is 571-272-1340. The examiner can normally be reached on M-Th with every Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Keith D. Hendricks can be reached on 571-272-1401. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Rodney G. McDonald/
Primary Examiner, Art Unit 1724

Rodney G. McDonald
Primary Examiner
Art Unit 1724

RM
April 21, 2011